UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,981	08/15/2006	Yasunori Kijima	09792909-6759	8816

26263 7590 10/06/2009

SONNENSCHEIN NATH & ROSENTHAL LLP
P.O. BOX 061080
WACKER DRIVE STATION, WILLIS TOWER
CHICAGO, IL 60606-1080

EXAMINER	
CLARK, GREGORY D	
ART UNIT	PAPER NUMBER
1794	

MAIL DATE	DELIVERY MODE
10/06/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/597,981	KIJIMA ET AL.	
	Examiner	Art Unit	
	GREGORY CLARK	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 June 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-14 and 16-22* is/are pending in the application.

4a) Of the above claim(s) *8 and 15* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5, 7, 9, 11, 14 and 18-22* is/are rejected.

7)☒ Claim(s) *2-4,6,10,12,13 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The examiner acknowledges the receipt of the applicants' arguments date 06/29/2009. Claims 1, 6, 7 11,12, 13, 14, 17, 18 and 20-22 currently amended, 2-5, 9-10, 16 and 19 original.

Rejections and objections made in previous office action that does not appear below have been overcome by applicant's amendments and therefore the arguments pertaining to these rejections/objections will not be addressed.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. **Claim 1 is rejected under 35 U.S.C. 103(a) as being anticipated by Tsutsui (JP2003/264085) in view of Levin (US 6,245,471).**

3. **Regarding Claim 1,** Tsutsui discloses an organic semiconductor element (device) obtained by alternately (stacked or adjacent structure) laminating organic thin film layers and thin conductive film layers (abstract). Tsutsui discloses that the organic thin layers function as the light emitting layers (plurality) (paragraph 20). The examiner

takes the position the thin conductive layers are equivalent to charge generating layers. Tsutsui discloses that the organic structure of the device is provided between a positive electrode and a negative electrode (abstract). The thin conductive film layers can be made from alkali metal oxides (paragraphs 103 and 104). Tsutsui fails to mention a complex oxide comprising at least one alkali metal or alkaline metal.

Levin discloses a charge generation layer containing a charge generation compound and at least one titanate. The charge generating compounds include phthalocyanine-based compounds (column 4, line 5) (applicants' specification page 37). Preferably, the titanate comprises a metal titanate (column 2, lines 42-45). Various titanates are known in the art and are suitable for use charge generation layers. Examples of suitable metal titanates include, alkali metal titanates (column 4, line 8).

The charge generation layers disclosed by Levin improve electrical characteristics by reducing dark decay and/or improving sensitivity, as compared with a charge generation layer in which the charge generation layer comprises a charge generation compound in the absence of at least one titanate (column 2, lines 58-64).

The examiner takes the position that complexes are commonly used in charge generating layer and Levin discloses the alkali metal titanates (applicants' specification page 19) in particular are used. Levin also discloses that alkali metal titanates are used in charge generating layers along with phthalocyanine-based compounds titanates (applicants' specification page 37). The alkali metal titanates offer improves electrical properties.

With a reasonable expectation of success a person of ordinary skill in the art at the time of the invention would have selected from known metal complexes which would have included alkali metal titanates.

3. **Claims 5, 7 and 22 are rejected under 35 U.S.C. 103(a) as being anticipated by Tsutsui (JP2003/264085) in view of Kita (US 6,656,608).**

4. **Regarding Claim 5**, Tsutsui teaches alternately (stacked or adjacent structure) laminating organic thin film layers and thin conductive film layers (charge generating layers) (abstract). Tsutsui fails to teach an oxide containing interfacial layer on an anode side of the charge generation layer.

Kita discloses and electroluminescent device that can contain a buffer layer (interfacial layer) can be provided between the electrode and the organic compound layer for lowering the driving voltage or raising the light emission efficiency (column 54, lines 1-4). Kita further discloses that the buffer layer can contain an oxide (column 54, lines 9 and 10). The buffer includes an anode buffer layer and a cathode buffer layer (column 54, lines 5-6).

With a reasonable expectation of success, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have modified the stacked electroluminescent structure of Tsutsui with the addition of an oxide containing interfacial (buffer) layer on the anode side as taught by Kita since Kita discloses that

such interfacial layer assist in lowering the driving voltage or raising the light emission efficiency.

5. **Regarding Claims 7 and 22**, Tsutsui teaches alternately (stacked or adjacent structure) laminating organic thin film layers and thin conductive film layers (charge generating layers) (abstract). Tsutsui fails to teach a phthalocyanine containing interfacial layer on a cathode side of the charge generation layer.

Kita discloses and electroluminescent device that can contain a buffer layer (interfacial layer) can be provided between the electrode and the organic compound layer for lowering the driving voltage or raising the light emission efficiency (column 54, lines 1-4). Kita further discloses that the buffer layer can contain a phthalocyanine (column 54, line 9). The buffer includes an anode buffer layer and a cathode buffer layer (column 54, lines 5-6).

With a reasonable expectation of success, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have modified the stacked electroluminescent structure of Tsutsui with the addition of a phthalocyanine containing interfacial (buffer) layer on the cathode side as taught by Kita since Kita discloses that such interfacial layer assist in lowering the driving voltage or raising the light emission efficiency.

6. **Claims 11, 14 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) in view of Zhu (Applied Physics Letters vol. 79, no. 8, 2001, p. 1205-1207).**

7. **Regarding Claim11**, Tsutsui teaches alternately (stacked or adjacent structure) laminating organic thin film layers and thin conductive film layers (charge generating layers) (abstract). Tsutsui fails to teach a metal fluoride containing interfacial layer on an anode side of the charge generation layer.

Zhu discloses an electroluminescent device that contains an insulating lithium fluoride (LiF) layer (interfacial layer) located between the anode and an organic layer (abstract). Zhu the incorporation of the LiF interfacial layer resulted in a shift of the operating voltage to a lower value and a higher electroluminescent efficiency (page 1205, left column).

With a reasonable expectation of success, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have modified the stacked electroluminescent structure of Tsutsui with the addition of a LiF containing interfacial (buffer) layer on the anode side as taught by Zhu since Zhu discloses that such a interfacial layer resulted in a shift of the operating voltage to a lower value and a higher electroluminescent efficiency.

8. **Regarding Claims 14 and 21**, Tsutsui discloses that the thin conductive layer (charge generating layer or electron/hole transporting layer) can be made from metal

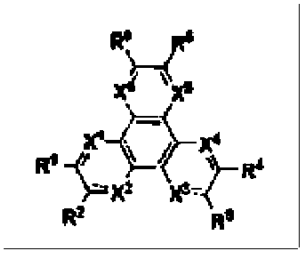
phthalocyanines and non-metal phthalocyanine (paragraphs 105 and 106) but fails to mention an interfacial layer on the cathode side.

Kita discloses and electroluminescent device that can contain a buffer layer (interfacial layer) can be provided between the electrode and the organic compound layer for lowering the driving voltage or raising the light emission efficiency (column 54, lines 1-4). Kita further discloses that the buffer layer can contain a phthalocyanine (column 54, line 9). The buffer includes an anode buffer layer and a cathode buffer layer (column 54, lines 5-6).

With a reasonable expectation of success, it would have been obvious to a person of ordinary skill in the art at the time of the invention to have modified the stacked electroluminescent structure of Tsutsui with the addition of a phthalocyanine containing interfacial (buffer) layer on the cathode side as taught by Kita since Kita discloses that such interfacial layer assist in lowering the driving voltage or raising the light emission efficiency.

9. **Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Ishiskawa (6,492,041).**

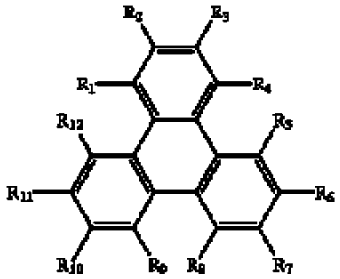
10. **Regarding Claim 9 and 16**, Tsutsui discloses that the thin conductive layer (charge generating layer or electron/hole transporting layer) can be made from metal phthalocyanines and non-metal phthalocyanine (paragraphs 105 and 106) but fails to teach the use of triphenylenes (formula 1 shown below).



..... Formula (1)

Wherein X can be C or N.

Ishiskawa teaches an organic electroluminescent device containing a luminescent layer and a hole transport layer (electron transport layer) composed of a triphenylene compound (abstract) represented by the structure shown below.



Ishiskawa also discloses that triphenylene compounds having a diarylamino group give excellent organic electroluminescent devices exhibiting an especially high luminance (column 2, lines 1-9). In the above structure X = C and R(s) can also be H.

At the time of the invention, a person of ordinary skill in the art with the teaching of Tsutsui and Ishiskawa would readily modify the charge generating layer of Tsutsui by incorporating the triphenylene compounds taught by Ishiskawa. The motivation for combining the reference would have been to improve the injection efficiency of holes into the light-emitting layer (column 1, lines 25-30).

11. **Claim 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) and Ueda (6,180,217) as applied to claim 11 above.**

12. **Regarding Claim 18**, Tsutsui discloses an organic semiconductor element (device) obtained by alternately (stacked or adjacent structure)) laminating organic thin film layers and thin conductive film layers (abstract). Tsutsui discloses that the organic thin layers function as the light emitting layers (plurality) (paragraph 20).

The examiner takes the position the thin conductive layers are equivalent to charge generating layers and the structure disclosed by Tsutsui represents light-emitting and charge generating layers arranged in an adjacent fashion. Tsutsui also teaches that the thin conductive layer (charge generating layer) can contain an organic compound/ charge transport material (paragraph 105 (per claim 18)). Tsutsui discloses that organic structure of the device is provided between a positive electrode and a negative electrode (abstract). Tsutsui fails to mention that the charge generation layer contains alkali or alkaline earth metals.

Ueda discloses that it is desirable to form the electron-injection layer using a mixed layer of an electron transporting material (conducting material or organic compound) and metal or metal fluoride layer (composed of alkali or alkaline earth metals). The examiner takes the position that the metal fluoride is being formed on the electron transporting material (conducting material). The brightness of the luminescent element can be increased by the formation of an electron-injection layer containing metal fluorides, and the drive voltage can be reduced to prolong the service life (column

31, lines 44-51). Tsutsui and Ueda fail to mention that the layers are in contact with each other from the side of the anode.

The examiner takes the position that through routine experimentation a person of ordinary skill at the time of the invention would readily vary the location of the stacked layers including positioning the charge generating layer containing the organic compound and the alkali or alkaline earth metals to interface with any layer in the device in the course of optimizing the injection efficiency of holes into the light-emitting layer to achieve optimal luminescent output with a minimum voltage input. Such manipulations of layer location would be based on routine experimentation designed to optimize the device performance, absent unexpected results.

13. **Regarding Claim 20,** Tsutsui and Ueda teach the invention of claim 18 described above. Tsutsui and Ueda fail to mention the alkali/alkaline metals in the mixed layer at more than 50% in terms of the relative thickness percentage. Ueda discloses the effect alkali/alkaline metals have on the charge generating or hole transporting layer device performance. The incorporation of materials (alkali/alkaline metals) having a large ionization potential into the hole-transporting layer produce devices which require a lower voltage to initiate luminescence, provide luminescence efficiency and stability over a long service life (column 33, lines 30-38).

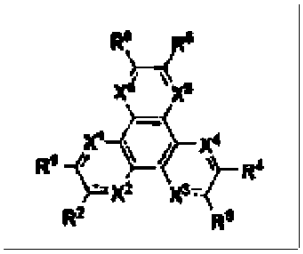
With a reasonable expectation of success, at the time of the invention a person of ordinary skill in the art would adjust the percent amount of the alkali/alkaline metals in

the charge generating layer to optimize the voltage requirements, luminescence efficiency, and overall stability of the device.

14. **Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsutsui (JP2003/264085) in view of Ueda (6,180,217) and further in view of Ishiskawa (6,492,041).**

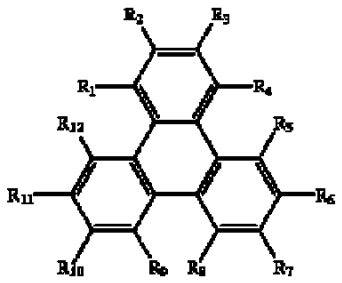
15. **Regarding Claim 19**, Tsutsui discloses that the thin conductive layer (charge generating layer or electron/hole transporting layer) can be made from metal phthalocyanines and non-metal phthalocyanine (paragraphs 105 and 106).

Ueda discloses that the metal fluorides conducting materials include LiF and MgF_2 can be used in the charge generating layer. Both Tsutsui and Ueda fail to teach the use of triphenylenes in the charge generating layer (formula 1 shown below).



..... Formula (1)

Ishiskawa teaches an organic electroluminescent device which includes a luminescent layer and a hole transport layer (electron transport layer) composed of a triphenylene compound (abstract) represented by the formula 2 shown below.



Formula 2

Ishiskawa also discloses that triphenylene compounds having a diarylamino group give excellent organic electroluminescent devices exhibiting an especially high luminance (column 2, lines 1-9).

At the time of the invention, a person of ordinary skill in the art with the teaching of Tsutsui/ Ueda and Ishiskawa would readily modify the charge generating layer of Tsutsui/ Ueda by incorporating the triphenylene compounds taught by Ishiskawa. The motivation for combining the references would have been to improve the injection efficiency of holes into the light-emitting layer (column 1, lines 25-30).

Allowable Subject Matter

Claims 2-4, 6, 10, 12-13 and 17are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

For Claims 2-4, the prior art did not show a charge generation layer composed of a complex oxide such as Lithium silicate or a mixed charge generation layer composed of a complex oxide plus a charge transport material.

For Claim 6, the prior art did not show a charge generation layer composed of a lithium silicate, lithium carbonate or cesium carbonate.

For Claim 10, the prior art did not show an interfacial layer composed of a metal oxide and an organic compound on the anode side of a charge generation layer.

For Claims 12-13 and 17 the prior art did not show a mixed interfacial layer on the anode side composed of a metal fluoride plus a charge transport material.

Response to Amendment

The examiner agrees with the applicant in reference to claim 1 that Tsutsui only teaches a simple oxide. Based on the amended nature of the claim Levin has been added which shows complex oxide were known in the art.

The examiner agrees with the applicant in reference to claims 7 and 22 that the Tsutsui does not appear to teach and interfacial layer on the cathode side of the charge generating layer containing a phthalocyanine. Based on the amended nature of the claims Kita has been added which shows clear advantages for an interfacial layer containing a phthalocyanine.

The examiner has incorporated Zhu who shows clear advantages for incorporating interfacial layer composed of a fluoride on the cathode side that addresses the limitations of claims 11, 14 and 21.

The examiner maintains in claims 9 and 16 that the hole transporting layer of Ishiskawa can act as an electron transporting layer and an electron transporting layer is equivalent to a charging layer. Ishiskawa teaches a triphenylene compound (X1-X6 = C) that read on the applicants' formula 1 where X1-X6 = C or N.

The examiner maintains in claim 18 that Ueda show an electron transporting layer (charge generating layer) between the anode and light emitting layer. Ueda further discloses that it is desirable to form the electron-injection layer using a mixed layer of an electron transporting material (conducting material or organic compound) and metal or metal fluoride layer.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to GREGORY CLARK whose telephone number is (571)270-7087. The examiner can normally be reached on M-Th 7:00 AM to 5 PM Alternating Fri 7:30 AM to 4 PM and Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Larry Tarazano can be reached on (571) 272-1515. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/D. Lawrence Tarazano/
Supervisory Patent Examiner, Art Unit 1794

GREGORY CLARK
Examiner
Art Unit 1794